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Time-Based Separation Demonstrator

User Guide

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Review and Approval

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1	Time-Based Separation Demonstrator, Software Requirements Document.	GL/EDEP/C0095/REQ/1, V1.0. Graffica, January 2009
2	Time-Based Separation Demonstrator, Detailed Design Document.	GL/EDEP/C0095/DES/1, V1.0. Graffica, January 2009
3	eDEP CWP User Guide	GL/EDEP/CWP_UG/1, V1.0. Graffica, August 2007
4	eDEP PVT User Guide	GL/???, V1.0. Graffica, August 2007

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Comments:

Any comments on this document should, in the first instance, be addressed to Mike Humphrey.

1 Introduction

This is the user guide for the Time-Based Separation (TBS) Demonstrator as specified in the TBS SRD [Ref 1], and described further in the TBS DDD [Ref 2]. The document details the procedures for installing, running and operating the platform and outlines the problem reporting procedures. The document also provides useful information relating to the demonstrator's configuration.

Only information specific to the TBS demonstrator is covered – repeating information already contained elsewhere is deliberately avoided, unless it is of particular importance, or differs in some way. Other suggested reading includes the eDEP CWP User Guide [Ref 3], and the eDEP PVT User Guide [Ref 4].

1.1 Document Overview

This document contains the following sections:

This section outlines the purpose of the document, and its contents.

Section 2 details the steps needed to launch the TBS Demonstrator: installation, executing, launch options.

Section 3 contains information useful during a demonstration, explaining the TBS windows and features, and how to control aircraft.

Finally, section 4 describes the configuration of the demonstrator, listing the relevant files, their important details, and how to change them.

2 Launching

2.1 Installation

Although no installation is necessary – the TBS Demonstrator can be run directly from the CD - it can be copied onto the local hard drive if required, and this may improve performance. Simply copy the contents to the desired location. If java (version 6 or greater) is already installed on the machine, then omitting the JRE folder from the copy can save time and disk-space.

2.2 Executing

To start the demonstrator simply run the included script (.bat or .sh). This will bring up the Launcher window, in which various options can be selected before running the demonstration proper. The figure below shows the Launcher window.
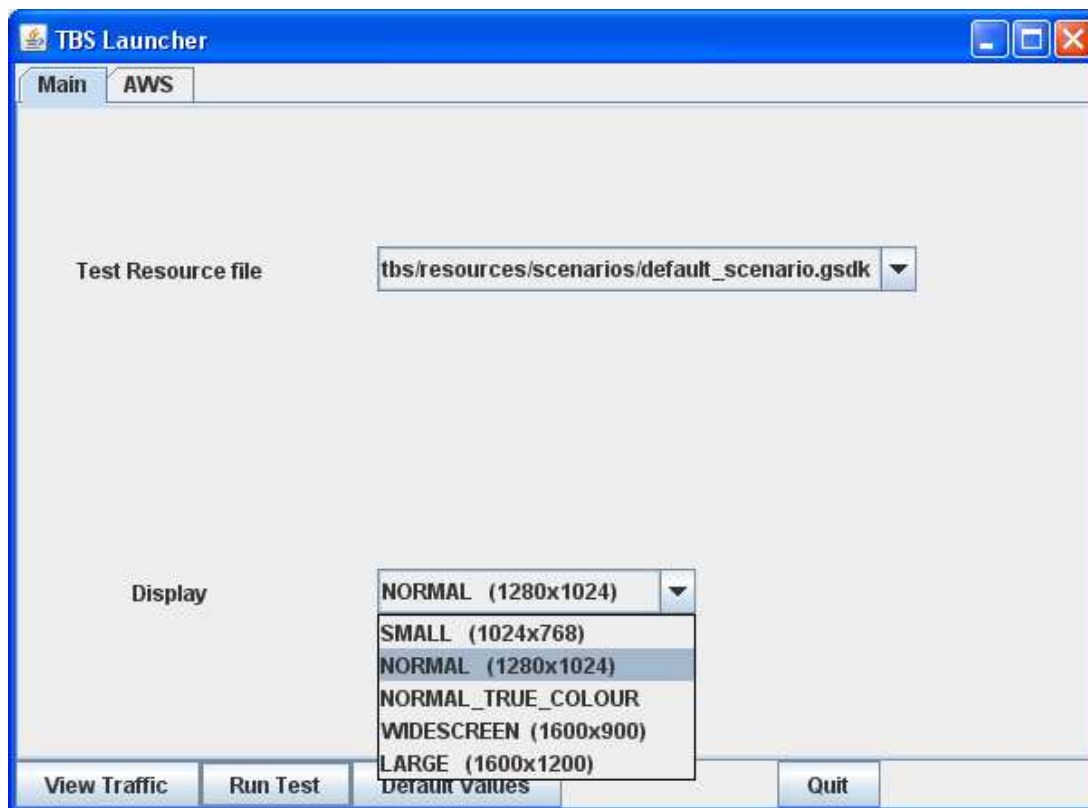
Figure 2-1 TBS Launcher Window

2.2.1 Scenario

The first drop down menu allows the scenario to be chosen – simply select the name of the required scenario from the list. Currently the scenarios define the traffic and the TBS area, though this can be extended to cover more options.

2.2.2 Display size

The final drop down menu gives a range of options of display size, from which the most suitable option can be selected to tailor the size of the CWP according to the screen on which it will be displayed.

2.2.3 Running

To run the demonstrator with the selected options, click on the "Run Test" button. It will be ready in a few seconds, and two main windows will be displayed – the CWP itself (see the CWP guide [Ref 3]) and an eDEP Console, for controlling the demonstration (see next section).

Alternatively, "View Traffic" can be clicked to run the PVT (see Ref 4) for viewing/editing traffic and airspace. In particular it may be useful for determining the co-ordinates of the required TBS area (see TBS Area Definition).

2.2.4 Demonstrator Management

An eDEP console window is displayed as part of the demonstrator, and is shown in the picture below:

Figure 2-2 eDEP Console Window

The four buttons, from left to right are:

> ➢ Stop   - shuts down the demonstrator.
>
> ➢ Pause   - pauses the demonstrator, while still allowing full interaction.
>
> ➢ Play   - advances the time in the demonstrator in real-time.
>
> ➢ Fast-forward   - doubles the current speed (plays at double-speed if paused).

The 'TOOLS' menu, has options to view the version of the eDEP platform the demonstrator is using, and to view all the current resources (see 4.2).

2.3 Problem Reporting

Any problems found should, initially, be reported to the eDEP Project Manager.

Include a description of the problem, and a copy of the log-file "*edep_log.txt*", that is created in the directory from which the demonstrator is launched. It is useful, if possible, to activate debug output (see 4.2.3.1) before running, to provide additional information in the log-file to help with investigating the problem.

3   During the Demo

This section covers the information needed during a demonstration, in particular the TBS windows and features, but also 'standard' features that have been modified for the TBS demonstrator.

3.1   General

When the demo is launched, the CWP will appear, with layout and appearance similar to this screenshot:

Figure 3-1 CWP

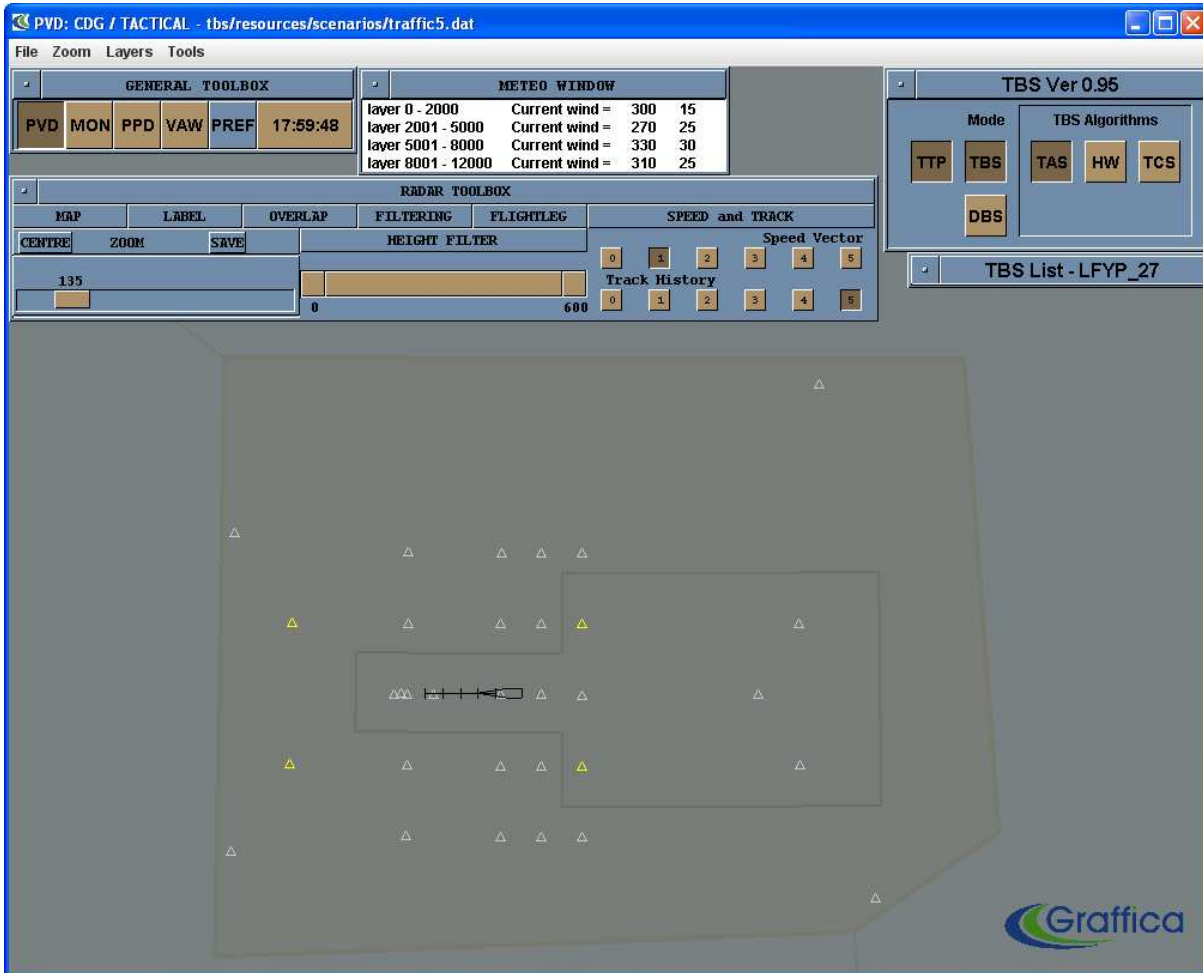The standard features, including toolboxes and menus are described in the CWP User Guide [Ref 3].

The TBS Configuration Window (top-right corner), TBS List Window (just below it), and Meteo Window are described in the subsequent sections. The shaded area of the display denotes the area of airspace controlled by this position, and the other outlined area marks the TBS area for the contained runway.

3.2 TBS Features

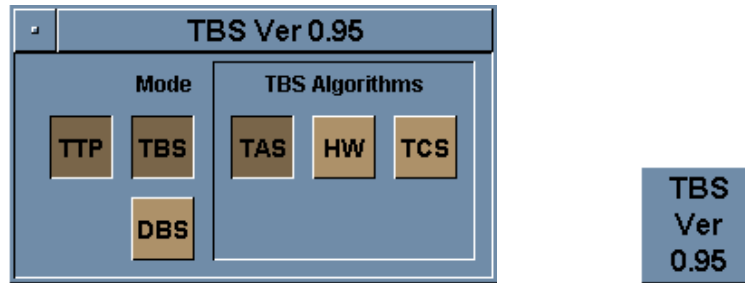### 3.2.1 Configuration Window

Figure 3-2 TBS Configuration Window and Icon

The TBS Configuration Window is shown above in normal and iconized forms. Both forms show the version of the current implementation of TBS. Clicking on the 'dot button' in the title bar of the window reduces it to an icon; clicking on the icon restores it to the full window.

The window contains the following buttons and button groups:

> ➢ TTP vector button   This simple on/off button controls the display of TTP vectors for sequenced aircraft. More details on TTP vectors is given in section 3.2.3.

> ➢ TBS and DBS mode buttons   These radio buttons (meaning only one can be selected at once) control whether Time-Based or Distance-Based Separation information is displayed.

> ➢ TBS algorithm buttons   These radio buttons control which algorithm is used as the source of information when the display is in TBS mode. Clicking on one when in DBS mode also automatically changes the mode to TBS.

3.2.2 List Window

Figure 3-3 TBS List Window (empty) and Icon

The TBS List Window is shown above in its initial and iconized forms. Both forms show the name of the runway for which the window displays sequence information. Clicking on the 'dot button' in the title bar of the window reduces it to an icon; clicking on the icon restores it to the full window.

As aircraft enter the TBS area, and therefore the sequence, a line for each aircraft is added to the window, as follows:

Figure 3-4 TBS List Window

Each line contains:

  – The position of the aircraft in the sequence,

  – the aircraft callsign,

  – the aircraft type,

  – the wake turbulence category of the aircraft,

  – the calculated length (in NM) of the aircraft's TTP (Trailing Target Position) vector.

For certain categories, the wake turbulence section may be high-lighted (e.g. heavy) or low-lighted (e.g. light). The high-lighting colour is the same as the TTP Vector display colour, which is dependent on the current (TBS/DBS) display mode.

3.2.2.1 Aircraft Selection

An aircraft can be selected in the CWP by moving the mouse into its aircraft label or into its entry in a TBS List Window. Selecting an aircraft causes it to be highlighted wherever it appears, i.e. selecting it in the TBS List Window highlights the entry there and the aircraft label, and vice versa, as seen in this picture:
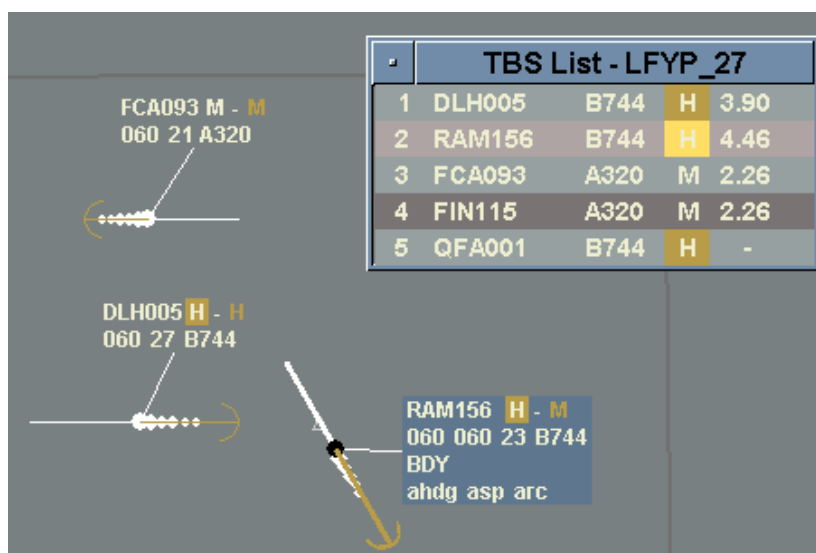
Figure 3-5 List Window and Aircraft Label Highlighting

Moving the mouse over the aircraft's wake turbulence category, again in either location, also selects the aircraft's leader, highlighting that aircraft's label and list window entry as well.

3.2.2.2 Sequence Modification

The default sequence can be modified. Clicking on a sequence number causes that aircraft, to be selected for re-positioning: the sequence number is marked with a border, the cursor changes, and a horizontal line is displayed indicating the insertion point. A modification in progress can be seen here:

Figure 3-6 List Window Sequence Modification

As the mouse is moved up and down, the line moves, jumping to the nearest insertion point, including before the first aircraft, and after the last. If the mouse is clicked again, a request is sent to re-position the selected aircraft at the indicated position in the sequence, and the sequence is re-calculated accordingly.

The operation can be cancelled by clicking the right mouse button anywhere.

Re-sequencing an aircraft causes a locking of the affected section of the sequence: from the first aircraft, up to and including the aircraft concerned. Other aircraft will no longer be automatically inserted into a locked section – the earliest they can be inserted is directly after the manipulated aircraft. Multiple re-sequences have a cumulative locking effect: a 2nd aircraft re-positioned earlier in the sequence than the first will not change the locked section, whereas one re-positioned later will extend the locked section to its own position.

Aircraft which are automatically inserted into a sequence, and are therefore affected by this locking, include those entering the TBS area, and those whose trajectory is modified changing their planned arrival time, e.g. a change of route or speed.

3.2.3 TTP Vector

The Trailing Target Position vector is displayed behind an aircraft and shows the position of minimum separation for the follower aircraft:
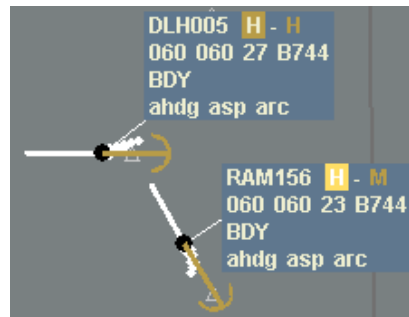
Figure 3-7 Sequenced Aircraft with TTP Vectors

The calculated TBS vector for an aircraft pair is never longer than the equivalent DBS vector. A TBS vector, even if calculated to be shorter, is never displayed shorter than the overall minimum DBS separation, typically 2.5 NM.

The colour of the vector depends on the separation being displayed – TBS or DBS. The previous screenshot shows TBS mode, the next one, DBS mode.

Figure 3-8 TTP Vector in DBS mode

If a TBS vector increases in length by more than a defined tolerance, then after a short delay the TTP is declared invalid, and will flash until it becomes valid again. The flash state can be seen in the picture below. Note that this will only be seen in TBS mode.
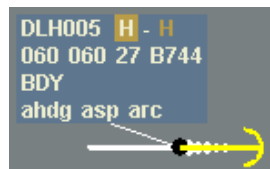
Figure 3-9 Invalid TBS TTP Vector

3.2.4 TBS Area

The display of the TBS areas can be turned on and off via the Layers->OVERLAY MANAGER menu:
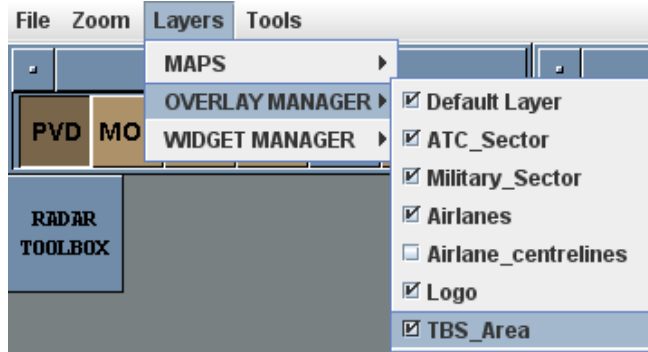
Figure 3-10 TBS Area Display Menu

3.2.5 Meteo Window

The Meteo Window displays, text form, the wind data for each defined weather layer. Each line shows the altitude range over which it applies, the direction from which the wind is coming, and its strength in knots. A simple example is shown here:

Figure 3-11 Meteo Window

The weather may change with time. The Meteo Window will quietly update the displayed data, but will not draw attention to the changes.

3.3 Controlling Aircraft

Various controller orders can be given to the aircraft, via menus accessed from the aircraft label. These are all described in the following sections.

3.3.1 Aircraft Label

A general description of aircraft labels, how they function, and their interactions is included in the CWP User Guide [Ref 3] and makes useful background reading. This section describes the label as it appears in the TBS demonstrator, and the following sub-sections describe the relevant interactions, and menus through which controller orders can be given.

3.3.1.1 Appearance

The following are labels for aircraft not included in a TBS sequence:

Figure 3-12 Aircraft Labels (unselected and selected) for Un-sequenced Aircraft

The first (unselected) label shows the following information:

- ➤ First row
  - o Aircraft callsign
- ➤ Second row
  - o Current FL, with optional arrow indicating climbing or descending
  - o Cleared FL (altitudes below the defined transition level are displayed with a leading zero)
  - o Aircraft Speed, in 10s of knots
  - o Aircraft Type

A selected label includes the following additional information:

- ➤ Third row
  - o Exit Waypoint (usually "BDY" – as the aircraft is landing, there is no next sector to exit to)
- ➤ Fourth row
  - o Assigned heading (or "ahdg" if no current controller order given)
  - o Assigned Speed, in 10s of knots (or "asp" if no current controller order given)
  - o Assigned Rate of Climb/Descent (or "arc" if no current controller order given)

The following are labels for aircraft included in a TBS sequence:

Figure 3-13 Aircraft Labels (unselected and selected) for Sequenced Aircraft

In addition to the standard information, the wake turbulence category of the aircraft, and that of the follower aircraft, are displayed on the first row. The former follows the same colouring rules as in the TBS List Window (3.2.2), the latter is the same colour as the TTP Vector (3.2.3).

3.3.1.2 Interactions

Clicking with the right-mouse button on the Callsign turns on or off the display of the trajectory and Extended Label Window (ELW) for that aircraft:
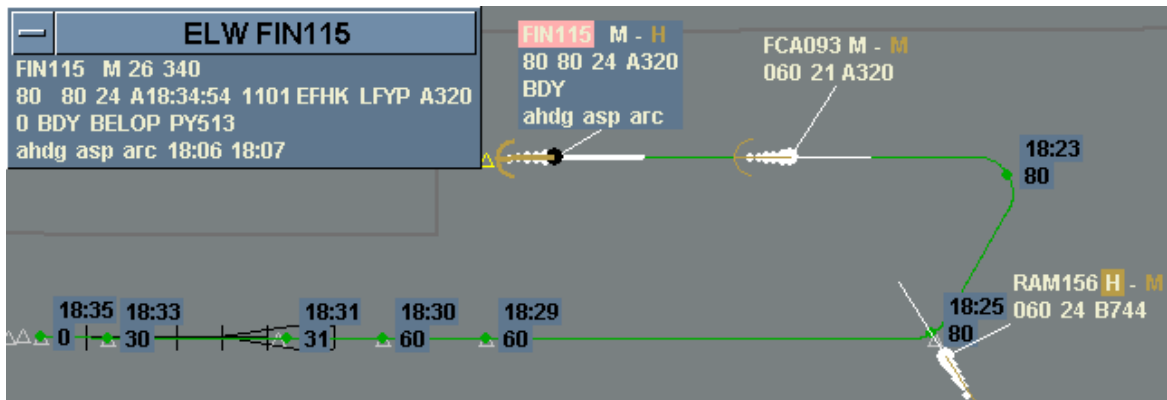

Figure 3-14 Trajectory and Extended Label Window

The trajectory shows the remaining route, with waypoints, and time and altitude at each point. The ELW shows the same as the aircraft label, with additional information including estimated arrival time, SSR code, and origin and destination airports.

Pressing and holding (rather than clicking) the right-mouse button on the callsign displays the same information, but only while the button is held.

These functions also operate from the callsign in the TBS List Window.

The same operations on the Exit Waypoint display the trajectory but not the ELW.

3.3.1.3 Kill Flight

It is possible to remove a flight from a simulation in progress. To do this double-click with the middle mouse button on the aircraft's callsign (again this will work in either the aircraft label or the TBS List Window). This will activate the Kill Flight Dialog:
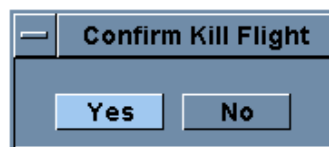

Figure 3-15 Kill Flight Dialog Box

Click on 'Yes' to confirm the kill operation. After a short delay the flight will disappear from the CWP, and in the next update it will be removed from the TBS sequence, the sequence re-calculated, and the TBS List Window contents updated accordingly.

3.3.2 Menus

3.3.2.1 Altitude Menu

The altitude menu is activated by clicking on the Cleared FL in the aircraft label:

The menu contains a range of flight-levels, centred on the aircraft's current CFL.

The flight-levels available can be scrolled up or down using the arrow buttons.

As in the aircraft label, flight-levels below the defined transition level are displayed with a leading zero.

Clicking on one of the values sends a CFL order to the aircraft: the new chosen value will be displayed in the aircraft label, and the aircraft will climb/descend to the new level.

Clicking the right mouse button anywhere removes the menu without sending an order.

If no further altitude orders are given, the aircraft will continue to follow those in its trajectory, typically a stepped descent to the runway threshold.
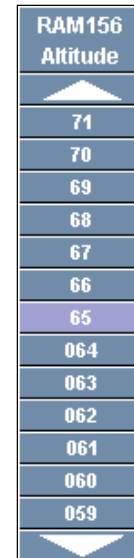
Figure 3-16 Altitude Menu

3.3.2.2 Direct To Menu

The direct-to menu is activated by clicking on the Exit Waypoint in the aircraft label:

The menu contains the next 7 waypoints on the aircraft's trajectory.

Clicking on one of the waypoint names sends a direct order to the aircraft to head to that waypoint: the clearance (waypoint name) will be displayed in the aircraft label, and the aircraft will turn towards the point. The TBS sequence will be re-evaluated based on the new trajectory, and the sequence modified and re-calculated if necessary and possible (see 3.2.2.2 - Sequence Modification).

Clicking the right mouse button anywhere removes the menu without sending an order.

Figure 3-17 Direct To Menu

If no further lateral orders are given, once the aircraft reaches the selected waypoint it will follow the rest of its trajectory.

3.3.2.3 Heading Menu

The heading menu is activated by clicking on the assigned heading (or "ahdg") in the aircraft label:

The menu contains a range of headings, centred on the aircraft's current heading (or nearest rounded value to it).

The headings available can be scrolled clockwise or anti-clockwise using the arrow buttons.

Clicking on one of the values sends a heading order to the aircraft: the cleared value will be displayed in the aircraft label, the aircraft will turn towards the point, and the trajectory will be updated with a 'best guess' as to the controller's intentions to guide the aircraft to the runway. The TBS sequence will be re-evaluated based on this trajectory, and the sequence modified and re-calculated if necessary and possible (see 3.2.2.2 - Sequence Modification).

Clicking the right mouse button anywhere removes the menu without sending an order.
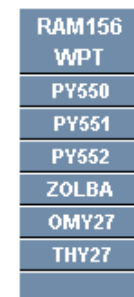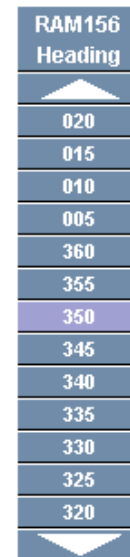
Figure 3-18 Heading Menu

There are two approaches to creating the 'best guess' trajectory above. If the chosen heading intercepts the existing trajectory (after allowing for the aircraft to turn and follow the heading for a minimum amount of time), then the initial heading, and the trajectory from the intersection point onwards, are used to compose the new trajectory. If no intercept is found, then the existing trajectory is searched for a waypoint where only a gentle turn is needed to re-join the trajectory, and the trajectory from this point onwards is used as the basis for the new one instead.

Note, the aircraft will **not** follow the new trajectory: if no further lateral orders are given, it will continue on the cleared heading indefinitely.

3.3.2.4 Speed Menu

The speed menu is activated by clicking on the assigned speed (or "asp") in the aircraft label:

The menu contains a range of speeds (in knots), centred on the aircraft's current speed (or nearest rounded value to it).

The speeds available can be scrolled up or down using the arrow buttons.

Clicking on one of the values sends a speed order to the aircraft: the new cleared value will be displayed in the aircraft label, the aircraft will fly at the new speed, and the trajectory is updated to reflect the new speed. The TBS sequence will be re-evaluated based on the new trajectory, and the sequence modified and re-calculated if necessary and possible (see 3.2.2.2 - Sequence Modification).

Clicking on RESUME sends an order to the aircraft to resume its default speed profile: any previous speed clearance is removed from the aircraft label, and the same updates are made as above.

Clicking the right mouse button anywhere removes the menu without sending an order.
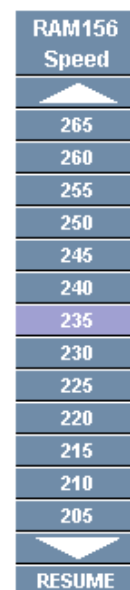
Figure 3-19 Speed Menu

3.3.2.5 ROCD Menu

The rate of climb/descent menu is activated by clicking on the assigned rocd (or "arc") in the aircraft label:

The menu contains a range of vertical speeds.

The speeds available can be scrolled up or down using the arrow buttons.

Clicking on one of the values sends a vertical speed order to the aircraft: the new cleared value will be displayed in the aircraft label, and the aircraft will climb/descend at the requested rate for any current and future climbs/descents.

Clicking on RESUME sends an order to the aircraft to resume its default vertical speed profile: any previous speed clearance is removed from the aircraft label, and the aircraft uses its default climb/descent speeds from now on.

Clicking the right mouse button anywhere removes the menu without sending an order.

Figure 3-20 Rate of Climb/Descent Menu

4 Configuration

4.1 General

Several files that affect the operation of the TBS demonstrator are made available for editing so the demonstrator can be customised. These are found under the tbs/resources directory. There are two types of file:

1. GSDK resource file (.gsdk extension) containing resources in the format <Group>.<Name>   <Value>.

2. Data file (.dat extenstion) containing data in a structured format dictated by the reading component.

All files are in plain text (ASCII) and easily viewed and edited with any basic text editor.

4.2 Resource files

There are many resources in the system most of which are not relevant and/or should not be changed for the TBS Demonstrator. The relevant, modifiable, resources have been grouped into a small number of GSDK resource files, which can be found under the tbs/resources directory and are described in the sub-sections below:

> ➢ common/threshold_speeds.gsdk

> ➢ defaults/cwp_defaults.gsdk

> ➢ defaults/tbs_defaults.gsdk

The complete set of resources defined in the system can be viewed at any time, by selecting, from the Console window, the TOOLS->Resources item. This brings up a window in which all the resources can be browsed, but not edited – most of the ones relevant to the demonstrator start with "TBS."!

4.2.1 Threshold Speeds

This file defines the threshold speed used for each aircraft type by the TCS implementation of the TBS algorithm. The speeds are defined in the format:

```
TBS.THRESHOLD_SPEEDS (
      (A306 130),
      (A30B 135),
      …
      (TRIN 75)
)
```

where each line lists an aircraft type and the associated speed in knots.

If traffic is added with a new aircraft type not yet listed here, then a line should be added for it. Existing values can also be modified, e.g. to improve accuracy.

4.2.2 CWP Defaults

This file contains resources controlling the display and operation of the CWP. Generally, it should not need to be modified by the user. There are, however, a few entries that might be useful:

```
CWP_CDG.PVD.LATITUDE    49.1
CWP_CDG.PVD.LONGITUDE   3.0
CWP_CDG.PVD.SCALE       300

QNH.TRANSITION_LEVEL    65
```

The first three control the centre and zoom factor of the CWP when it is first displayed. The second, self-evidently, defines the transition level.

4.2.3 TBS Defaults

This file contains resources controlling the TBS implementation and calculations, though some will also affect the CWP.

The following resource lists the runways for which a TBS sequence will be calculated and managed, along with the associated TBS Area (for historical reasons the name of the TBS area is repeated). A TBS List Window is created for each runway listed (see 3.2.2):

```
TBS.MANAGED_RUNWAYS  ( (LFYP_27, CDG_COMP, CDG_COMP),
                       (LFZP_27, LFZP, LFZP) )
```

The algorithms resource lists the variants of the TBS algorithm along with the name of the implementing class. An algorithm button is created in the TBS Configuration Window for each algorithm listed (see 3.2.1). The subsequent entry defines which algorithm (button) is selected when the demonstrator is launched.

```
TBS.ALGORITHMS (
      ("TAS", "tbs.tbs.server.calculator.TASTBSTTPCalculatorImpl" ),
      ("HW",  "tbs.tbs.server.calculator.HWTBSTTPCalculatorImpl" ),
      ("TCS", "tbs.tbs.server.calculator.TCSTBSTTPCalculatorImpl" ) )

TBS.INITIAL_ALGORITHM  "TAS"
```

The following resources list the meteo 'tag' to be used by each of the TBS implementation algorithms that use meteo data. The names listed must correspond to a weather entity defined in the meteo data file (see 4.3.3):

```
TBS.METEO_TAG.TAS       "ACTUAL"
TBS.METEO_TAG.HW        "ACTUAL"
```

The following resource lists the defined wake turbulence categories, and their representative character. This resource is in place for future enhancements and should not currently be modified:

```
TBS.WAKE_TURBULENCE_CATEGORIES  ( ("H", "HEAVY"  ),
                                  ("M", "MEDIUM" ),
                                  ("L", "LIGHT"  ) )
```

The following resource defines the separation distances for the DBS algorithm for each possible Leader-Follower aircraft pair combination, based on the defined wake turbulence categories (Heavy, Medium, Light). It is laid out with leader aircraft in rows and follower aircraft in columns, so for example, the first entry on the last row (highlighted) gives the separation for a heavy aircraft following a light leader aircraft:

```
TBS.DBS_SEPARATION_DISTANCES  ( ( 4,   5,   6),
                                (2.5, 2.5,   5),
                                (2.5, 2.5, 2.5) )
```

The following resource controls whether or not a list window that has been iconified should be automatically restored when its contents change (aircraft added or removed, or sequence changed):

```
TBS.LIST_WINDOW.AUTO_RESTORE   TRUE
```

4.2.3.1 Debug output

Additional debug information detailing the calculations and operation of the TBS server can be included in the log file by uncommenting the following two lines (removing the leading '//'):

```
//DEBUG            TRUE
//TBS.DEBUG_APP    TRUE
```

This information is quite verbose, and in a busy scenario (or at higher speeds) can significantly affect performance, so this should only be activated if needed.

4.3   Data files

The following data files are available and are described in the sub-sections below:

- ➢ common/airspace.dat
- ➢ common/bada_performance.dat
- ➢ meteo file (in defaults)
- ➢ TBS areas files (in defaults)
- ➢ traffic files (in scenarios)

4.3.1   Airspace Data

This file defines the airspace features used by the demonstrator: fixes, airports, sectors, runways, etc. It should not normally need modifying, but extra fixes or STARs could be added, for example. The format is usually self-explanatory from the existing entries.

4.3.2   BADA Data

This file contains BADA aircraft performance data, previously converted to the eDEP file format. It defines various parameters for each aircraft type. The section of interest for the TBS demonstrator is the low level speed profile (the descent CAS in particular) defined for each aircraft type:

```
LOW_LEVEL_SPEED
      ALTITUDE    0 3000 6000 10000
      CLIMB_CAS   155 180 250 250
      ALTITUDE    10000 6000 3000 0
      DESCENT_CAS 250 220 220 130
   END
```

An arbitrary number of altitudes and corresponding CAS values can be defined. A descending aircraft gradually decelerates from its general descent CAS, to the descent CAS defined for the highest altitude in this low level speed section, starting at 1.2 times this altitude. E.g. for the speeds defined above, at 10,000ft, 6,000ft, etc., the aircraft will start to decelerate when it reaches 12,000ft, reaching a CAS of 250 knots at 10,000ft. Below this level there is a similar linear deceleration from one speed/altitude to the next.

If traffic is added with a new aircraft type not yet listed here, then a complete entry should be added for it.

4.3.3   Meteo Data

This file contains meteo data, specifically one or more named weather definitions, forming a grid centred on a point, with 1 or more timed sets of weather data defined in layers:

```
WEATHER ACTUAL    48.9 2.4
  GRID      2   2        // degrees

  TIME      "17:45:00"
  LAYER ALTITUDE  0     2000
    WINDSPEED           ROW   15
    WINDDIRECTION       ROW   300
  END
  LAYER ALTITUDE  2001  5000
    WINDSPEED           ROW   25
    WINDDIRECTION       ROW   270
  END
  LAYER ALTITUDE  5001  8000
    WINDSPEED           ROW   30
    WINDDIRECTION       ROW   330
  END
  LAYER ALTITUDE  8001  12000
    WINDSPEED           ROW   25
    WINDDIRECTION       ROW   310
  END
```

```
TIME       "18:15:00"
LAYER …
```

In the example above, one weather entity, named "ACTUAL" is defined over point 48.9°, 2.4° with a grid spacing of 2° latitude and 2° longitude, and a 1x1 g rid of data defined in each layer. An arbitrary number of timed weather sets, layers, and grid sizes can be used, though the grid size must be the same in each case. The layers need not be the same in number or altitude range at each time.

An entry for "ACTUAL" must be included for the TBS demonstrator, though additional entries can be added, e.g. for use by the TBS algorithms (see `4.2.3 – TBS Defaults` above).

The following shows a sample extract for a weather entity with a 2x3 grid:

```
WEATHER ACTUAL    48.0 2.5
  GRID      2.0  1.5   // degrees

  TIME       "18:00:00"
  LAYER ALTITUDE  0     3000
    WINDSPEED           ROW    15    17    16
                        ROW    13    16    16
    WINDDIRECTION       ROW    300   300   285
                        ROW    310   290   290

  END
  LAYER ALTITUDE  3001  7000
    WINDSPEED           ROW    20    21    18
                        ROW    22    21    19
    WINDDIRECTION       ROW    300   300   285
                        ROW    320   295   303
  END
```

Although a grid of any size can be defined, and will be taken into account by the demonstrator, both for calculating trajectories, and TBS vectors, only the first element from any layer will currently be displayed in the Meteo Window (3.2.5).

4.3.4 TBS Area Definition

Three TBS area definition files are provided, with entries like the following

```
TBSAREA CDG_COMP
    REGION
            ALTITUDE 0.0 99000.0
            49.0    2.25
            49.0    2.84
            49.15   2.84
            49.15   3.75
            48.71   3.75
            48.71   2.84
            48.85   2.84
            48.85   2.25
    END
    COMPUTE RUNWAY LFYP_27
```

The first line defines the area name. The area will be used for the calculation of a sequence for the runway defined in the last line. The area is a region whose outline is defined by an arbitrary number of lat/long points, and extending over an altitude range defined in feet.

4.3.5 Traffic Files

Three traffic files are provided, which can be modified/duplicated to change aircraft callsigns, start times, aircraft type and/or wake turbulence, starting level, route/STAR, etc.

4.4 Adding A New Scenario

One default scenario and two variations are supplied:

> ➢ scenarios/default_scenario.gsdk

> ➢ scenarios/scenario2.gsdk

> ➢ scenarios/scenario3.gsdk

It is not recommended that the default scenario is changed. New scenarios can be added, modelled on the other two files, whose contents are similar to the following:

```
@LOAD "tbs/resources/scenarios/base_scenario.gsdk"

ASP.SCENARIO      ( "tbs/resources/common/airspace.dat",
                    "tbs/resources/defaults/tbs_areas_medium.dat" )

IFPL.SCENARIO    "tbs/resources/scenarios/traffic3.dat"

METEO.SCENARIO   "tbs/resources/defaults/default_meteo.dat"
```

Ignoring the top line, the remaining entries allow the airspace and TBS areas, the traffic, and the meteo files to be changed. From these, a large variety of scenarios can be constructed. Only the items being modified need to be included, though if the airspace item is present it must list both the standard airspace and the TBS areas file to be used.

The time at which a scenario starts can also be altered by adding an entry like the following:

```
CLOCK.STARTTIME   "15:00:00"
```

In order to run a new scenario, an entry must be added to the file scenarios.dat.
E.g. `tbs/resources/scenarios/new_scenario.gsdk`

This will then appear in the list of scenarios in the Launcher Window (see 2.2) and can be selected before starting the demonstrator.

5 Glossary

AFL	Actual Flight Level
ATM	Air Traffic Management
BADA	Base of Aircraft Data
CAS	Calibrated Air Speed
CFL	Cleared Flight Level
CWP	Controller Working Position
DBS	Distance Based Separation
DDD	Detailed Design Document
eDEP	Early Development and Evaluation Platform
ELW	Extended Label Window
FL	Flight Level
GSDK	Graffica System Development Kit
HMI	Human-Machine Interface
HW	Head Wind
JRE	Java Runtime Environment
PVT	Profile Validation Tool
ROCD	Rate of Climb/Descent
SRD	Software Requirements Document
SSR	Secondary Surveillance Radar
STAR	Standard Terminal Arrival Route
TAS	True Air Speed
TBS	Time Based Separation
TCS	Threshold Crossing Speed
TTP	Trailing Target Position
WTC	Wake Turbulence Category